GRADE 12 DIPLOMA EXAMINATION

Biology 30

June 1990

Alberta
EDUCATION

GRADE 12 DIPLOMA EXAMINATION
BIOLOGY 30

DESCRIPTION

Time: 2½ hours

Total possible marks: 100

This is a **closed-book** examination consisting of **two** parts:

PART A has 70 multiple-choice questions each with a value of one mark.

PART B has seven written-response questions for a total of 30 marks.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

GENERAL INSTRUCTIONS

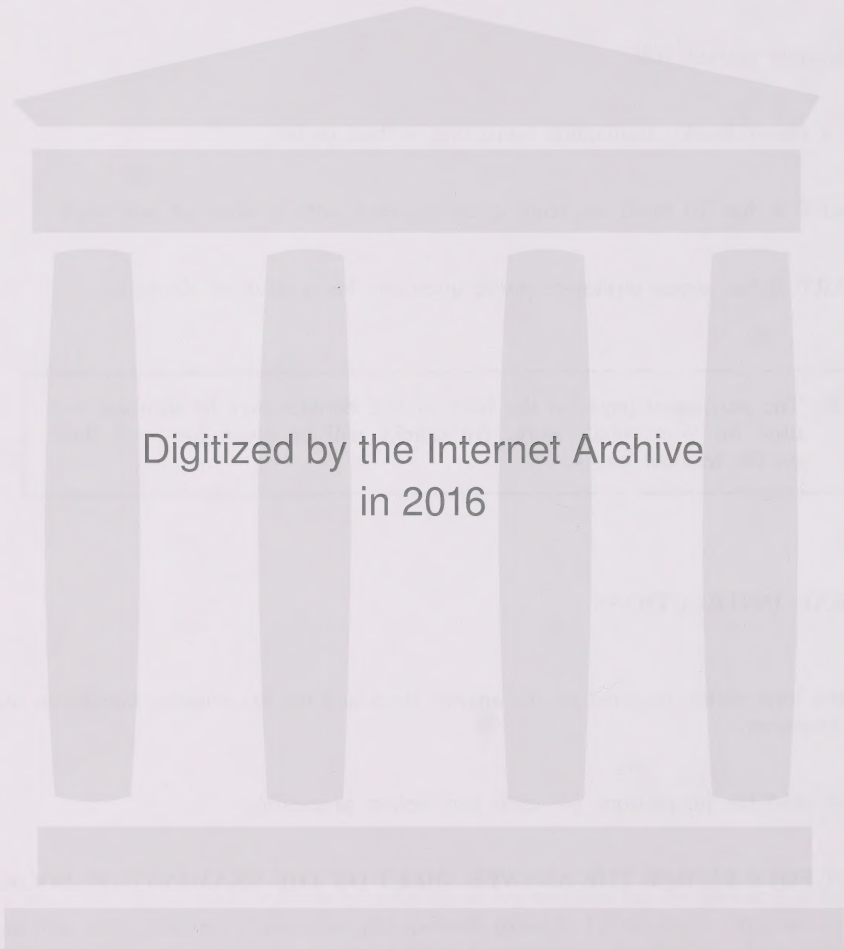
Fill in the information required on the answer sheet and the examination booklet as directed by the examiner.

Carefully read the instructions for each part before proceeding.

DO NOT FOLD EITHER THE ANSWER SHEET OR THE EXAMINATION BOOKLET.

The presiding examiner will collect your answer sheet and examination booklet and send them to Alberta Education.

JUNE 1990



PART A

INSTRUCTIONS

In this part of the examination, there are 70 multiple-choice questions each with a value of one mark.

Read each question carefully and decide which of the choices **best** completes the statement or answers the question. Locate that question number on the separate answer sheet provided and fill in the space that corresponds to your choice. **Use an HB pencil only.**

Example

This diploma examination is for the subject area of

A. Biology
B. Physics
C. Chemistry
D. Mathematics

Answer Sheet

A	B	C	D
●	②	③	④

If you wish to change an answer, erase your first mark completely.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

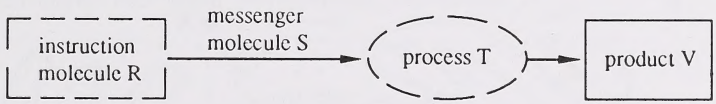
DO NOT TURN THE PAGE TO START THE EXAMINATION UNTIL TOLD TO DO SO BY THE PRESIDING EXAMINER.

1. Leukocytes possess organelles that destroy ingested antigens. These organelles are

A. contractile vacuoles
B. Golgi bodies
C. lysosomes
D. ribosomes

Use the following diagram to answer question 2.

A Model of a Metabolic Pathway

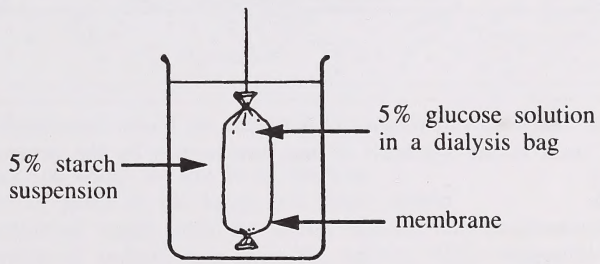


2. If product V is a protein, then process T occurs in which cell organelle?

A. Ribosome
B. Mitochondrion
C. Golgi apparatus
D. Endoplasmic reticulum

Use the following diagram to answer question 3.

An Experimental Apparatus to Test the Permeability of a Membrane to Starch



Reagents available: iodine, Benedict's solution

3. To determine if the membrane is permeable to starch, a sample should be taken from the

A. beaker and tested with iodine
B. dialysis bag and tested with iodine
C. beaker and tested with Benedict's solution
D. dialysis bag and tested with Benedict's solution

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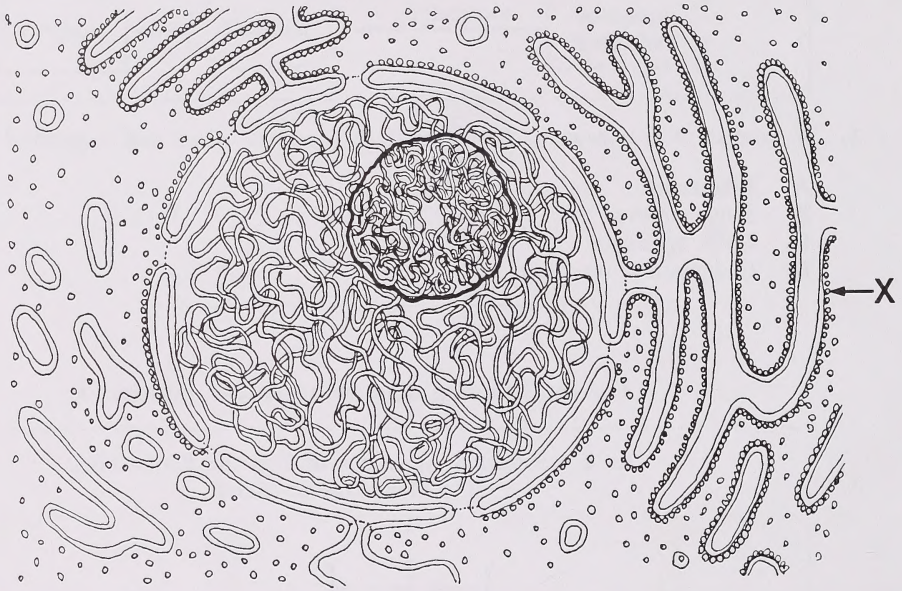
4. Substances that sustain life enter a cell by a variety of processes. Which process involves expending energy that has been generated by the cell?

A. Endocytosis
B. Filtration
C. Diffusion
D. Osmosis

Use the following diagram to answer question 5.

A Micrograph Illustration of Some Cell Organelles



5. Reactants used in the synthesis of macromolecules by the organelle labelled X are

A. lipids
B. amino acids
C. simple sugars
D. DNA molecules

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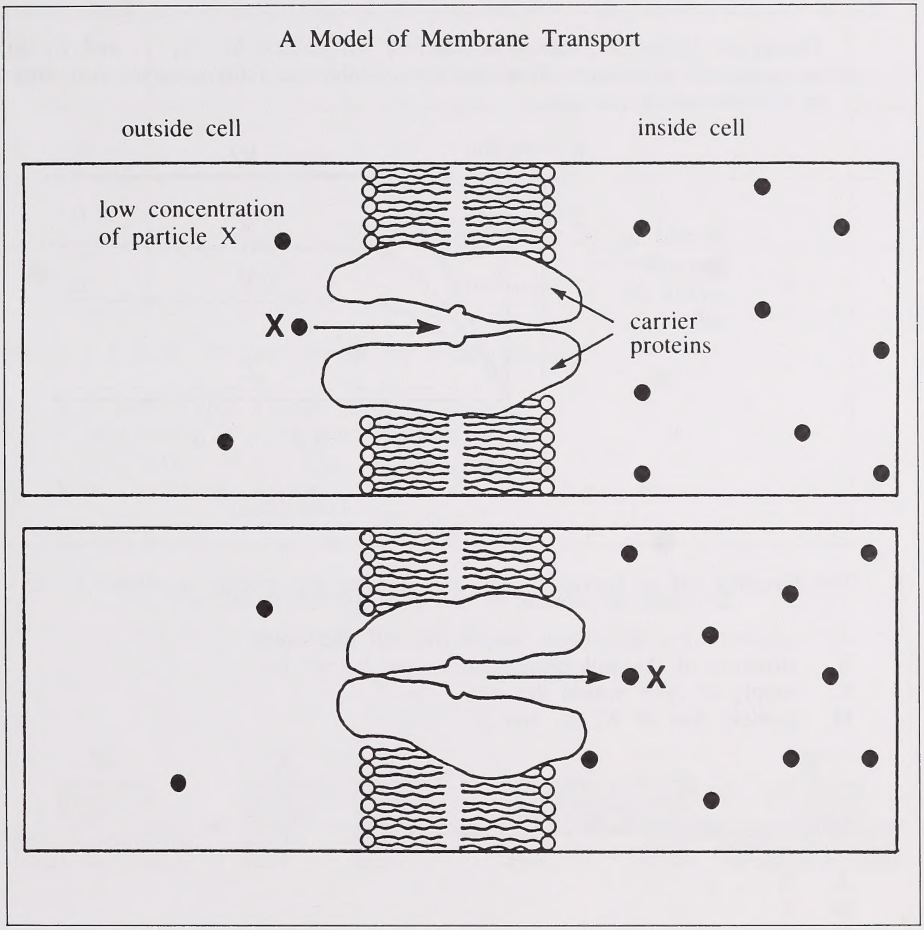
6. A comparison of pancreatic cells with heart muscle cells would show that pancreatic cells have a higher concentration of

A. ribosomes and lysosomes
B. ribosomes and Golgi bodies
C. lysosomes and mitochondria
D. mitochondria and centrioles

Use the following diagram to answer question 7.

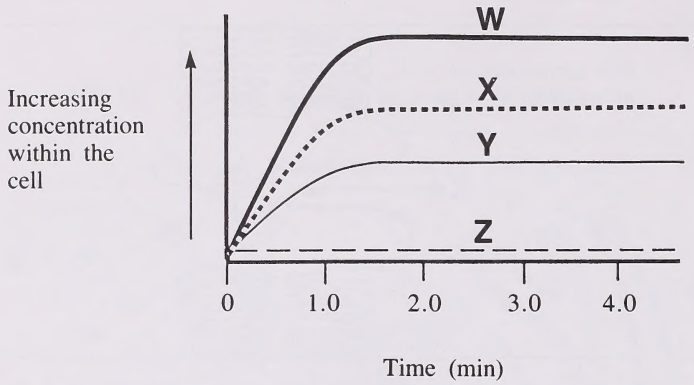


7. The process illustrated would be required for which physiological activity?

A. Absorption of water by the large intestine
B. Exchange of gases in the lungs and blood stream
C. Reabsorption of water from the kidney tubules into the surrounding capillaries
D. Reabsorption of sodium ions from the nephric filtrate by cells lining the kidney tubules

Interpret the following information to answer questions 8 and 9.

The graph shows the rate at which four substances, W, X, Y, and Z, diffuse across a cell membrane from the extracellular fluid (of constant concentration) to the interior of the cell.



8. The levelling off of curves W, X, and Y after one minute is related to the

A. concentration differences across the cell membrane
B. structure of the cell membrane
C. supply of ATP within the cell
D. particle size of W, X, and Y

9. Which substance is most likely a protein?

A. W
B. X
C. Y
D. Z

---

10. Homeostasis in an organism may be described as a condition in which the

A. external environment and the internal environment are the same

B. internal environment fluctuates with changes in the external environment

C. stability of bodily functions depends on the stability of the environment

D. internal environment is maintained relatively constant despite changes in the external environment

Use the following chart to answer question 11.

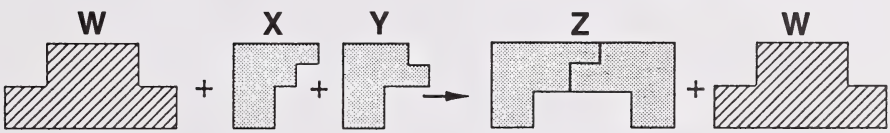
Solution	pH of Original Solution	Substance Added to Original Solution	pH of Resulting Solution
I	1	unknown X	1
II	2	unknown Y	1
III	2	unknown Z	8

11. Which is a likely interpretation of the results obtained?

A. X is water, Y is a base, and Z is an acid.
B. X is a buffer, Y is an acid, and Z is a base.
C. X is a buffer, Y is a base, and Z is an acid.
D. X is a hydroxide solution, Y is an acid, and Z is a base.

Use the following diagram to answer question 12.

A Model of a Chemical Reaction



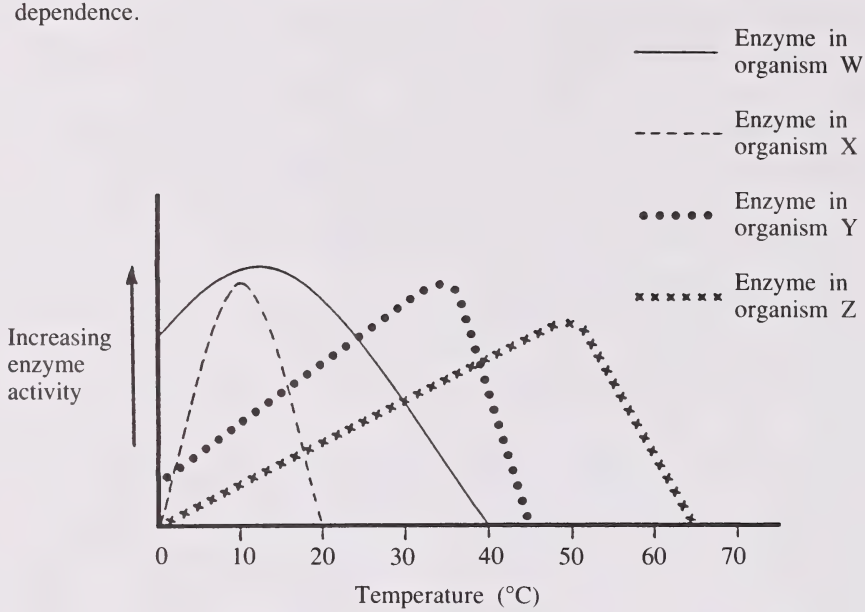
Note: The above diagram is based on the lock-and-key theory of enzyme action.

12. Which statement is correct?

A. Z is an enzyme.
B. W is a substrate.
C. X and Y are enzymes.
D. X and Y are substrates.

Interpret the following information to answer question 13.

The rate of reaction involving the same substrate in each of four different organisms, W, X, Y, and Z, is shown in the graph. Each organism has a different enzyme that catalyzes the same reaction but with different temperature dependence.



13. Which organism would most likely be a human?

A. W
B. X
C. Y
D. Z

---

14. A lack of certain vitamins in a person's diet may result in muscle fatigue because vitamins

A. supply energy for muscle contraction
B. prevent the production of lactic acid in anaerobic respiration
C. contain the high-energy phosphate bonds needed for contraction
D. are needed to form some of the coenzymes required in cellular respiration

Use the following chart to answer question 15.

Observations Made of a Digestion Experiment				
			Results of Biuret Test	
Contents of Test Tube	pH	Temperature	Beginning of the Experiment	Two Hours Later
egg white, pancreatic fluid, and water	8	37°C	positive	negative

15. The observations indicate that pancreatic fluid contains

A. fat-emulsifying agents
B. protein-digesting enzymes
C. chemicals that regulate pH
D. disaccharide-digesting enzymes

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16. The function of the liver that is most closely associated with the digestive process in the small intestine is the

A. production of an emulsifier
B. storage and distribution of vitamins
C. conversion of stored glycogen into glucose
D. change of potentially harmful substances into less harmful ones

17. Lazzaro Spallanzani, an 18th century Italian scientist, wished to learn more about human digestion. During a potentially dangerous investigation, he purposely swallowed pieces of sponge tied to a string. After pulling the pieces of sponge back up, he squeezed the liquid from them. He would have found that the liquid had a

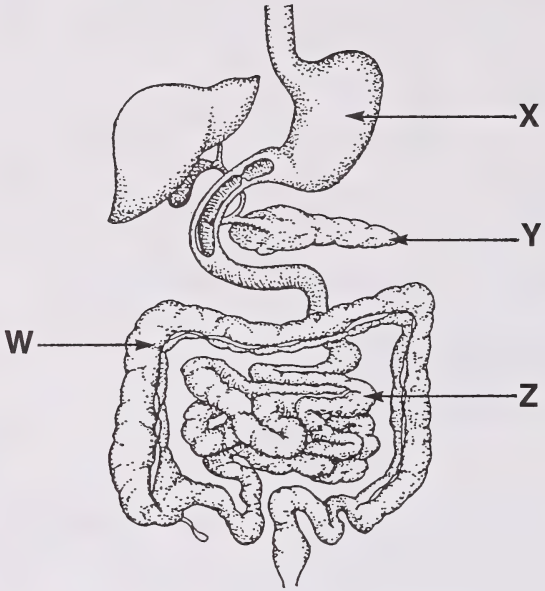
A. pH of less than 7 and a capacity to digest protein
B. pH of more than 7 and a capacity to digest starch
C. pH of less than 7 and a capacity to digest starch
D. pH of 7 and a capacity to digest protein

18. A sample of blood was taken from a person some time after the person had eaten a meal. It was found that the sample contained elevated concentrations of gastrin. The food that had been eaten probably contained a high proportion of

A. fat
B. sugar
C. starch
D. protein

Use the following diagram to answer question 19.

A Portion of the Human Digestive System



19. Complete digestion of proteins, carbohydrates, and lipids takes place in the structure labelled

A. W
B. X
C. Y
D. Z

Use the following incomplete paragraph to answer question 20.

Pulmonary Circulation

When the right ventricle of the heart contracts, blood flows into the __(1)__ on its way to the lungs, where it is oxygenated. Blood returns to the __(2)__ of the heart via the __(3)__.

20. The correct sequence of words for completing the blanks (1), (2), and (3) is

A. aorta, right atrium, pulmonary veins
B. aorta, left atrium, pulmonary artery
C. pulmonary artery, left atrium, pulmonary veins
D. pulmonary veins, right atrium, pulmonary artery

---

21. Which statement about blood clotting is **not** true?

A. Platelets release a substance that initiates clotting.
B. Bicarbonate ions must be present for clotting to occur.
C. The plasma protein fibrinogen is necessary for clotting.
D. The plasma protein prothrombin is necessary for clotting.

22. Edema, an excessive accumulation of tissue fluid, may result from

A. low blood pressure
B. decreased blood volume
C. obstruction of lymph vessels
D. increased plasma protein concentration

23. In order for the blood to pass from the right ventricle of the human heart to the left atrium, it must first move through

A. lung capillaries
B. an atrioventricular valve
C. the aortic semilunar valve
D. capillary beds of the digestive system

24. Veins that have been stretched excessively for long periods of time increase in cross-sectional area. Because the valves do not increase in size as well, they will

A. no longer block reverse flow of blood in the enlarged veins

B. use twice the energy in actively transporting the flow of blood in the enlarged veins

C. increase their muscle mass in order to maintain the proper return of blood to the heart

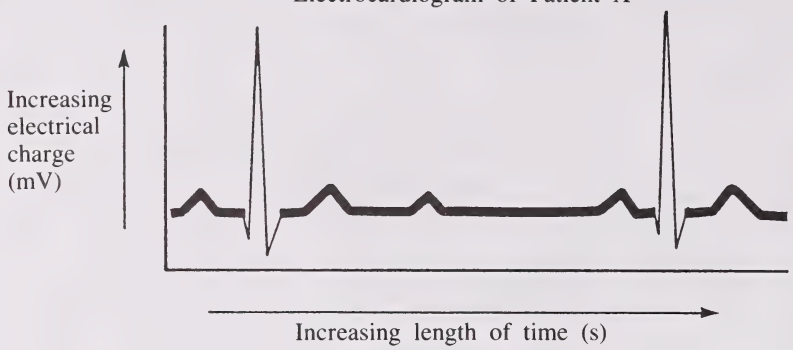
D. be flattened to such an extent by the weight of the blood that they will collapse, making it easier for blood to return to the heart by muscle action

25. If blood flow and blood pressure decrease, you would expect the capillary pressure to

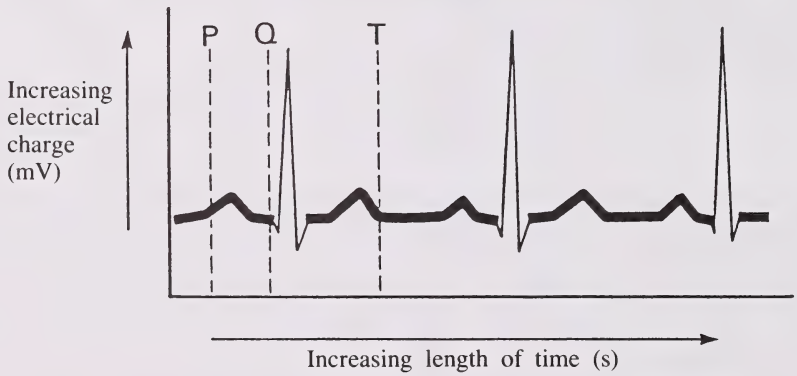
A. decrease, resulting in more fluid entering the tissue spaces from the capillaries
B. decrease, resulting in less fluid entering the tissue spaces from the capillaries
C. increase because proteins would be forced into the tissue spaces
D. increase because proteins would accumulate in the capillaries

Interpret the following electrocardiograms to answer question 26.

Electrocardiogram of Patient X



A Normal Electrocardiogram



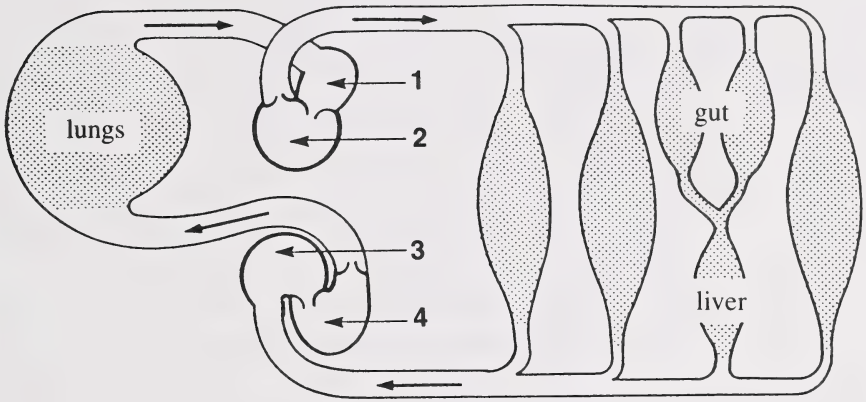
Note: The P-Q interval indicates the duration of atrial contraction.
The Q-T interval indicates the duration of ventricular contraction.

26. Patient X's electrocardiogram indicates that the

A. atria will not contract
B. ventricles will not contract
C. heart's pacemaker has not sent any impulses
D. atrioventricular node has not sent regular impulses

Use the following diagram to answer question 27.

A Schematic Representation of Human Circulation



27. The left ventricle is identified as

A. 1
B. 2
C. 3
D. 4

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28. Which vessels carry blood that is high in carbon dioxide?

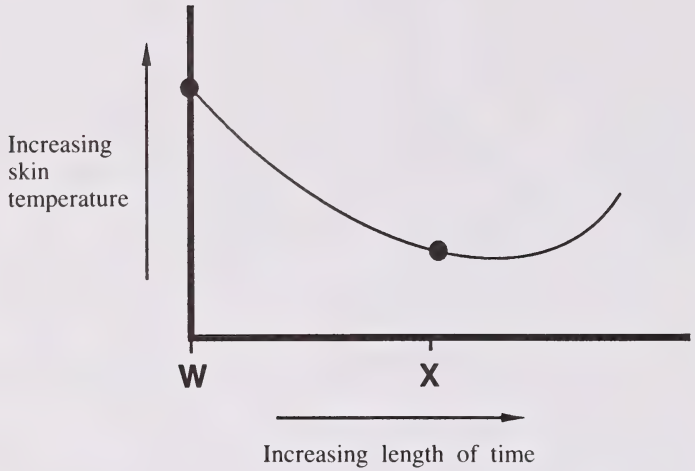
A. The aorta and pulmonary veins
B. The aorta and pulmonary arteries
C. Pulmonary veins and the superior vena cava
D. Pulmonary arteries and the superior vena cava

29. The movement of water between extracellular fluid and blood is facilitated by

A. capillary walls that are one cell-layer thick
B. an extensive active-transport system in the walls of the arterioles
C. an increase in the rate of blood flow from the capillaries to the arterioles
D. valves in the veins that decrease the rate of blood flow through the capillaries

Use the following information to answer question 30.

The Effect of Smoking on Skin Temperature



W: Individual starts smoking a cigarette
X: Individual finishes smoking the cigarette

30. The change in skin temperature between W and X is likely caused by

A. a decrease in heart rate
B. a drop in blood pressure
C. dilation of the blood vessels in the skin
D. constriction of the blood vessels in the skin

Use the following chart to answer question 31.

Data Obtained from Four Patients Who Have Circulatory Problems				
Patient	% Saturation of Hemoglobin with O_2 (arterial blood)	Cardiac Output (L/min)	Hemoglobin Content of Blood (g/L)	Heart Rate at Rest (beats/min)
I	80	5.5	186	71
II	52	5.5	148	80
III	88	3.0	152	112
IV	91	6.5	119	105
NORMAL	90	5.0	160	72

31. Which patient has been exposed to a chemical that is competing for the bonding sites of hemoglobin?

A. I
B. II
C. III
D. IV

---

32. The respiratory centre in the medulla oblongata causes the breathing rate to increase by

A. releasing H^+, which lowers the pH of the blood returning to the lungs

B. releasing adrenaline, which increases the rate of O_2 absorption by the lung capillaries

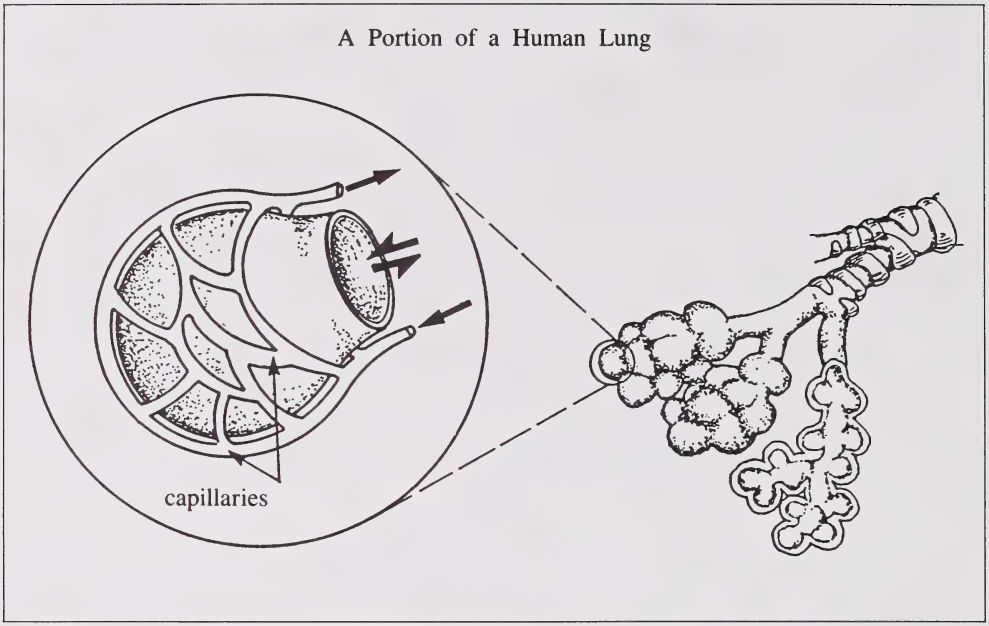
C. initiating nerve impulses, which increase the rate of diaphragm and rib muscle contractions

D. stimulating the vagus nerve, which increases the rate of blood flow through the lung capillaries

33. Food blocking the trachea can be dislodged by the Heimlich maneuver, which involves a quick upward thrust by a fist held on the victim's abdomen just above the navel. This procedure

A. initiates muscular action of the trachea
B. reverses peristalsis of the esophagus
C. pushes air out the esophagus
D. forces air out of the lungs

Use the following diagram to answer question 34.



34. Which process would take place at the greatest rate in the capillaries under normal conditions?

A. Oxyhemoglobin giving off O_2

B. Hemoglobin combining with O_2

C. Hemoglobin combining with CO_2

D. Oxyhemoglobin combining with H^+

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35. The diffusion of oxygen from capillaries in muscles occurs because of

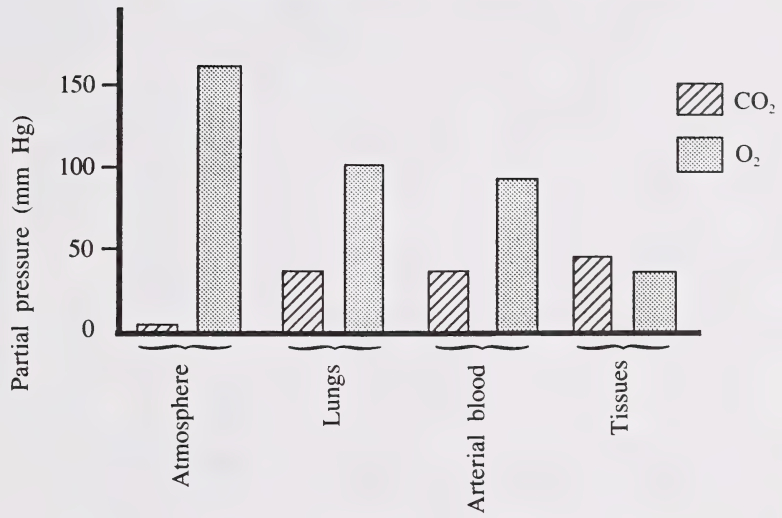
A. high concentration of carbon dioxide in the blood and low concentration in the tissues

B. low concentration of carbon dioxide in the blood and high concentration in the tissues

C. high concentration of oxygen in the blood and low concentration in the tissues

D. low concentration of oxygen in the blood and high concentration in the tissues

Use the following graph to answer question 36.



*The pressure exerted by a component in a mixture of gases.

36. An **incorrect** interpretation of the graph is that

A. as the O_2 partial pressure decreases, the CO_2 partial pressure increases

B. O_2 partial pressure increases as O_2 moves from the lungs to the blood

C. CO_2 partial pressure increases as CO_2 moves from the atmosphere to the tissues

D. the difference between O_2 and CO_2 partial pressure is much greater in the atmosphere than in the tissues

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37. Carbon monoxide emitted from a gasoline motor is hazardous because it

A. destroys hemoglobin in the red blood cells
B. prevents oxygen from passing through cell membranes
C. has a greater affinity for hemoglobin than does oxygen
D. prevents the separation of carbon dioxide from hemoglobin

Use the following chart to answer question 38.

CO_2 Regulation of Breathing		
CO_2 in Inhaled Air (%)	Volume of Inhaled Air (L/min)	Average Frequency (breaths/min)
0.0	6	12
1.0	8	12
2.0	10	13
3.0	13	14
4.0	16	15
5.0	23	16
6.0	30	20

38. Which is a correct inference based on the data?

A. The first response by the breathing centre to an increase in CO_2 concentration brings about an increase in the depth of breathing.

B. Each unit increase in CO_2 concentration of inhaled air produces a uniform increase in the volume of air inhaled.

C. The first response by the breathing centre to a decrease in CO_2 concentration brings about a decrease in breathing rate.

D. The CO_2 concentration of inhaled air has no effect on the frequency of breathing.

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39. Which substance can be used as an energy source in human cells?

A. Water
B. Minerals
C. Vitamins
D. Amino acids

Use the following pictographs to answer question 40.

Average Perspiration Rates at Various Air Temperatures and Activities

Activity	Perspiration Rate at Selected Air Temperatures			
	27°C	32°C	38°C	42°C
W 	0.4 L/h	0.8 L/h	1.1 L/h	1.6 L/h
X 	0.3 L/h	0.4 L/h	0.8 L/h	1.1 L/h
Y 	0.1 L/h	0.2 L/h	0.3 L/h	0.6 L/h

Note: Assume that all variables are controlled except the level of activity.

40. Which is **not** a valid inference or interpretation of the data?

A. The heat produced within the body during each activity remained about the same as the air temperature increased.

B. At 38°C, walking produced about four times the amount of heat that was produced while sitting in the shade at 38°C.

C. At 27°C, driving resulted in a rate of perspiration close to that experienced while sitting in the shade at 38°C.

D. The heat produced within the body while walking at 38°C was about the same as the heat produced within the body while driving at 42°C.

Use the following information to answer question 41.

Cell Processes

I. Osmosis
II. Active transport
III. Protein synthesis
IV. Diffusion

41. Which processes require energy from cellular respiration?

A. I and II
B. I and III
C. II and III
D. II and IV

Use the following information to answer question 42.

I. $\text{glucose} + O_2 \xrightarrow{\text{enzymes}} CO_2 + H_2O + \text{ATP} + \text{heat}$

II. $\text{glucose} + \text{ATP} \xrightarrow{\text{enzymes}} CO_2 + H_2O + \text{heat}$

III. $\text{glucose} \xrightarrow{\text{enzymes}} \text{lactic acid} + \text{ATP} + \text{heat}$

IV. $\text{glucose} \xrightarrow{\text{enzymes}} \text{glycogen} + \text{ATP} + \text{heat}$

42. The reaction that may occur in muscle cells under anaerobic conditions is represented by

A. I
B. II
C. III
D. IV

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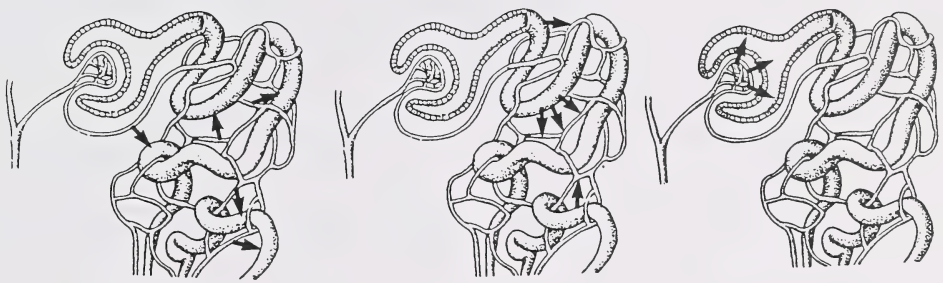
43. Some of the B vitamins function in the transfer of hydrogen and its electron in aerobic respiration. A lack of vitamin B in the diet would therefore result in

A. increased production of ATP
B. decreased production of H_2O
C. decreased levels of lactic acid in cells
D. increased utilization of O_2 as a strong acceptor

Use the following diagrams to answer question 44.

Three Nephric Processes



44. The processes shown in the three diagrams from left to right are

A. filtration, reabsorption, and secretion
B. filtration, secretion, and reabsorption
C. secretion, reabsorption, and filtration
D. secretion, filtration, and reabsorption

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45. In urine, the absence of large protein molecules is due to their inability to pass into

A. collecting ducts
B. Bowman's capsules
C. the urinary bladder
D. proximal convoluted tubules

46. Two important sources of the nitrogenous compounds excreted in urine are

A. fats and sugars
B. sugars and proteins
C. nucleic acids and proteins
D. nucleic acids and phospholipids

Use the following information to answer question 47.

Possible Responses to Dehydration of the Human Body

I. Increased water in the blood
II. Decreased water in the blood
III. Increased release of ADH
IV. Decreased release of ADH
V. Increased water reabsorption by the kidneys
VI. Decreased water reabsorption by the kidneys

47. In order to restore homeostasis in an individual, which sequence of responses occurs when the individual becomes dehydrated through prolonged perspiration?

A. I, III, and V
B. I, IV, and VI
C. II, III, and V
D. II, IV, and VI

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48. Which is a correct statement about the human retina?

A. Cone cells require less light for stimulation than rod cells.

B. Cone cells can discriminate between colors, whereas rod cells cannot.

C. Rod cells are more highly concentrated in the central portion of the retina.

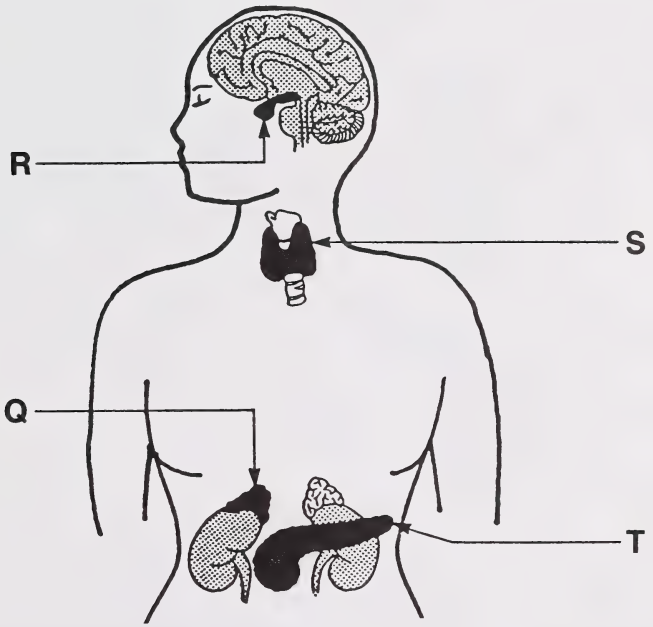
D. Rod cells form part of the choroid coat, whereas cone cells are located in the retina.

49. Some older people hold books at arm's length while reading. Which change associated with aging would account for this behavior?

A. The flexibility of the lenses has decreased.
B. The diameter of the eyeballs has increased.
C. The lenses have become cloudy (developed cataracts).
D. The number of functional rods and cones has decreased.

Use the following diagram to answer question 50.

The Human Endocrine System



50. The gland that functions in the **greatest** number of negative feedback systems is labelled

A. Q
B. R
C. S
D. T

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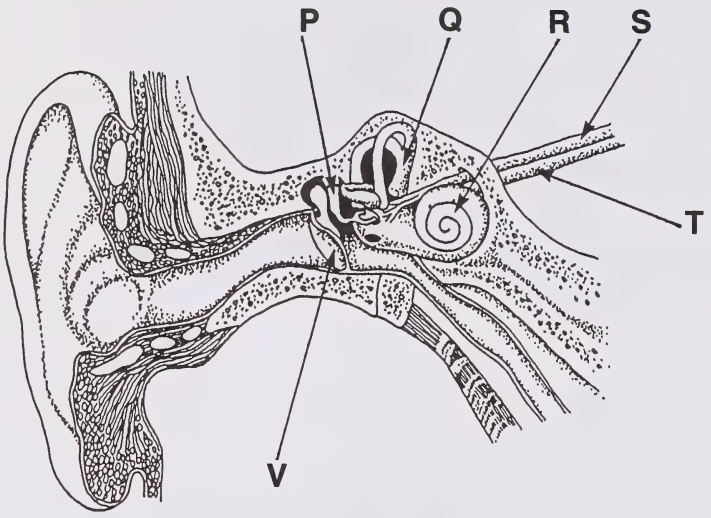
51. The sensory cells for detecting acceleration of the human body are located in the

A. semicircular canals
B. organ of Corti
C. cerebellum
D. cochlea

Use the following diagram to answer question 52.

The Human Ear



52. Within the ear, the transmission of air vibrations leading to sensory impulses would activate structures in which sequence?

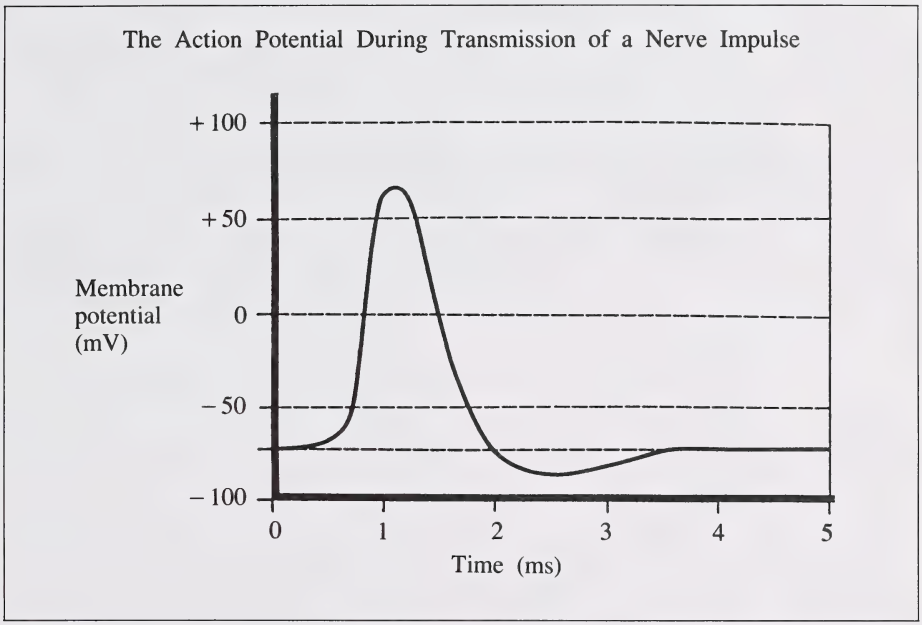
A. P, Q, R, and S
B. P, R, S, and T
C. V, P, Q, and S
D. V, P, R, and T

---

53. A person's pituitary gland is secreting insufficient amounts of thyroid-stimulating hormone (TSH). This will result in

A. excessive growth
B. decreased metabolic rate
C. greater production of thyroxin
D. further reduction of TSH secretion

Use the following graph to answer question 54.



54. The initial phase of the action potential is caused by

A. sodium ions leaving the nerve fibre
B. sodium ions entering the nerve fibre
C. potassium ions leaving the nerve fibre
D. potassium ions entering the nerve fibre

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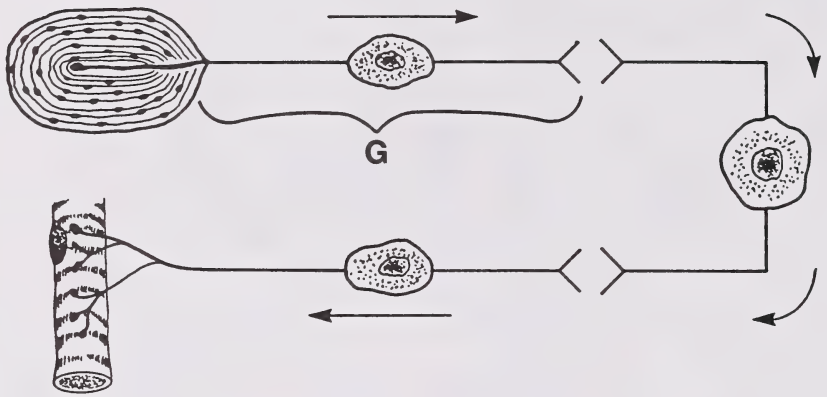
55. The initiation of a sensory impulse varies among individuals as a result of differences in the

A. reflex arcs
B. interneurons
C. effector neurons
D. thresholds of stimulation

Use the following diagram to answer question 56.

The Structures of a Reflex Arc



Note: The arrows show the direction of information flow.

56. The structure labelled G is a(n)

A. interneuron
B. motor neuron
C. sensory neuron
D. stimulus receptor

---

57. Response to a stimulus within the central nervous system differs from a response initiated by a reflex arc because the former

A. includes interpretation of information
B. does not release acetylcholine
C. undergoes depolarization
D. has greater speed

58. Which is controlled primarily by the autonomic nervous system?

A. Memory
B. Walking
C. Hearing
D. Peristalsis

Use the following information to answer question 59.

A person under the increasing influence of alcohol loses first the ability to speak clearly; second, the ability to walk a straight line; and third, the ability to breathe normally.

59. From the above evidence, in what order does alcohol affect the major divisions of the brain?

A. Cerebrum, cerebellum, and medulla oblongata
B. Cerebrum, medulla oblongata, and cerebellum
C. Medulla oblongata, cerebrum, and cerebellum
D. Medulla oblongata, cerebellum, and cerebrum

---

60. The wearing away of the upper and lower leg bones at the knee joint is prevented by

A. strong tendons that pull the two bones apart
B. strong ligaments that pull the two bones apart
C. fat deposits that lubricate the ends of the bones
D. thin layers of cartilage on the ends of the bones

61. Muscle contraction requires

A. actin, myosin, ATP, and calcium
B. actin, ATP, potassium, and calcium
C. actin, ADP, phosphorous, and myosin
D. myosin, ATP, phosphorous, and calcium

Use the following information to answer question 62.

A student's blood glucose level was tested before and after a five-minute exercise period. Results of the tests showed that the level of glucose in the blood of the student remained relatively constant.

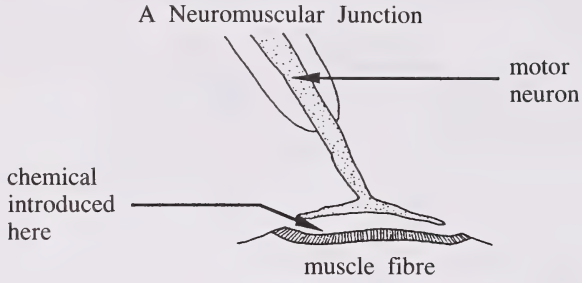
62. The major source of energy during the exercise was maintained by

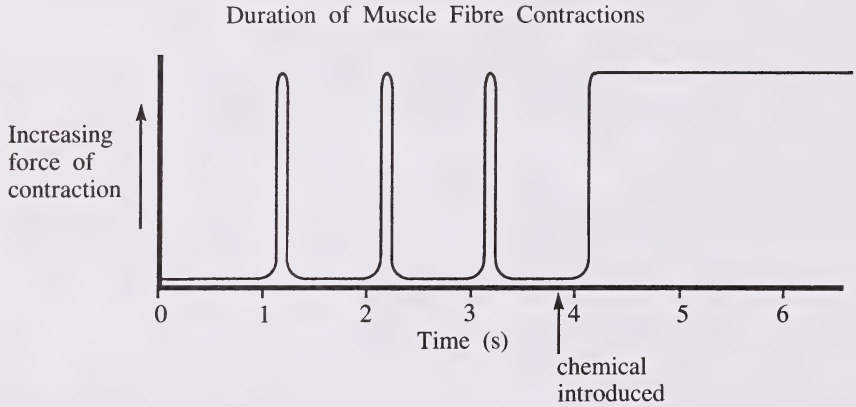
A. protein stored in the muscle fibres
B. actin and myosin stored in the muscle fibres
C. lipid stored in muscle fibres and broken down chemically
D. glycogen stored in muscle fibres and broken down chemically

---

Use the following information to answer question 63.

In an experiment, the effect of introducing a particular chemical into the neuromuscular junction of a muscle fibre was tested. The neuron of the neuromuscular junction was electrically stimulated at one-second intervals for a period of six seconds. The chemical was introduced at time equals 3.8 seconds. The results of the test are shown in the graph.





63. The best hypothesis is that the chemical

A. promotes the release of cholinesterase
B. is a competitive inhibitor for cholinesterase
C. is a competitive inhibitor for the bonding of actin and myosin
D. inhibits the release of acetylcholine from the motor end plates

---

64. In the human male, seminal vesicles function to

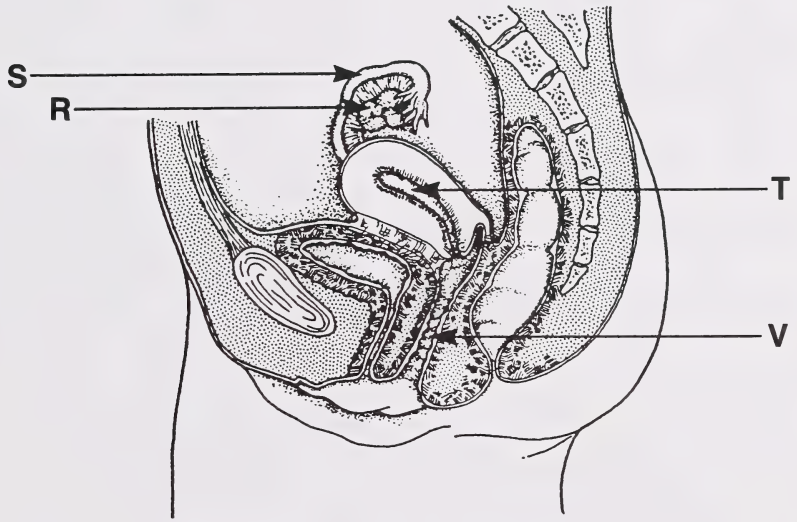
A. store sperm
B. synthesize and secrete testosterone
C. secrete substances into the urethra
D. secrete an alkaline substance into the seminal fluid

65. Sperm cells released from the seminiferous tubules of testes mature in the

A. vasa deferentia *(pl.)*
B. epididymides *(pl.)*
C. seminal vesicles
D. prostate gland

Use the following diagram to answer question 66.

A Sagittal Section of a Portion of the Human Female



66. Which pair of words identifying reproductive processes is matched correctly with the organs in which each process normally occurs?

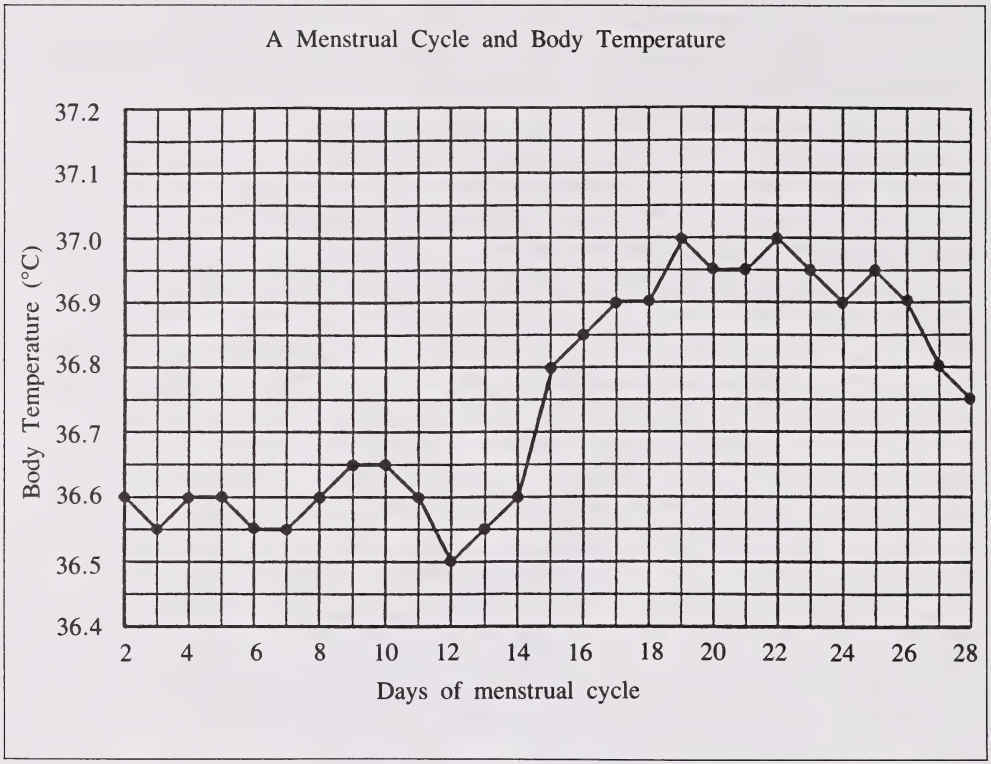
A. Ovulation – R; fertilization – V
B. Fertilization – S; implantation – T
C. Menstruation – T; ovulation – S
D. Implantation – T; menstruation – V

---

67. The development of an ovarian follicle is initiated by

A. progesterone
B. estrogen
C. FSH
D. LH

Use the following graph to answer question 68.



68. A correct inference from the data is that

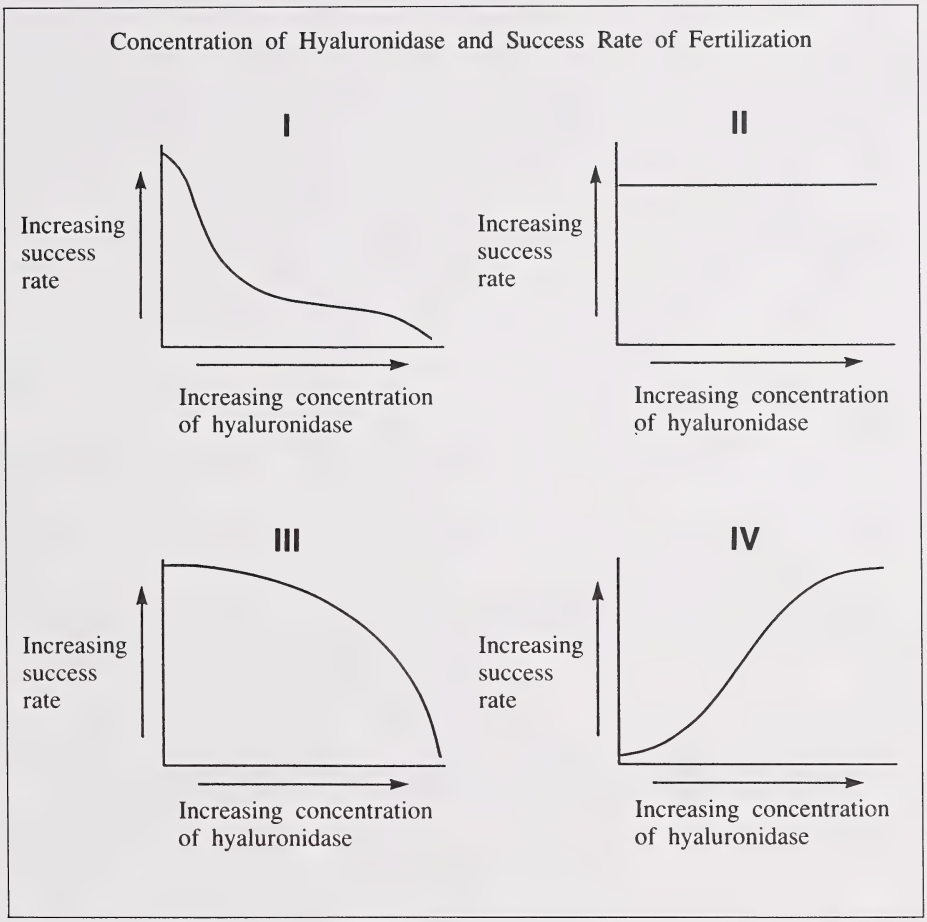
A. body temperature rises after ovulation
B. higher body temperature causes ovulation
C. lower body temperature triggers menstruation
D. there is no connection between body temperature and ovulation

---

69. If the ovaries of a pregnant woman are removed at some time during the first five months of pregnancy, a miscarriage results. If they are removed during the last four months of a pregnancy, a miscarriage does not take place. The loss of a fetus does not occur in the latter case because the

A. supply of maternal blood to the placenta is reduced
B. pituitary takes over the function of maintaining the pregnancy
C. placenta produces sufficient hormones to maintain the pregnancy
D. ovaries, before removal, produced a sufficient amount of hormone, which persists and thus maintains the pregnancy

Use the following graphs to answer question 70.



70. Hyaluronidase is an enzyme found in sperm that breaks down the egg-cell membrane and permits access to the ovum. Which graph shows the most likely relationship between the concentration of hyaluronidase and the success rate of fertilization?

A. I
B. II
C. III
D. IV

YOU HAVE NOW COMPLETED THE MULTIPLE-CHOICE PART OF THE EXAMINATION. PROCEED DIRECTLY TO PART B.

PART B

INSTRUCTIONS

In this part of the examination, there are seven written-response questions for a total of 30 marks.

Read each question carefully. Write your answers in the examination booklet as neatly as possible.

Communicate your answers in complete sentences unless the response format indicates otherwise. Marks will be awarded for pertinent explanations and answers. Question 3 has two marks allotted for written communication skills.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

START PART B IMMEDIATELY.

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Use the following information to answer question 1.

Four test tubes (A, B, C, and D) each containing 10 mL of water, one drop of oil, and 10 drops of litmus solution were used to examine the role of bile and lipase in fat digestion. Bile was added to test tube B, lipase to test tube C, and both bile and lipase to test tube D, as indicated on the chart. All four test tubes and their contents were incubated at 37°C.

Test Tube	Drops of Bile	Drops of Lipase	Color		
			Time = 0 min	Time = 10 min	Time = 20 min
A	0	0	blue	blue	blue
B	5	0	blue	blue	blue
C	0	20	blue	blue	pink
D	5	20	blue	pink	pink

Note: Litmus is an acid-base indicator that turns from blue to pink in an acidic environment.

(4 marks)

1. a. What product of digestion caused the pH to change in test tubes C and D?

Product _____

b. What conclusion can be reached by comparing

(i) test tube B to test tube D?

_____

_____

(ii) test tube C to test tube D?

_____

_____

c. Explain why different results were obtained from test tubes C and D.

_____

_____

_____

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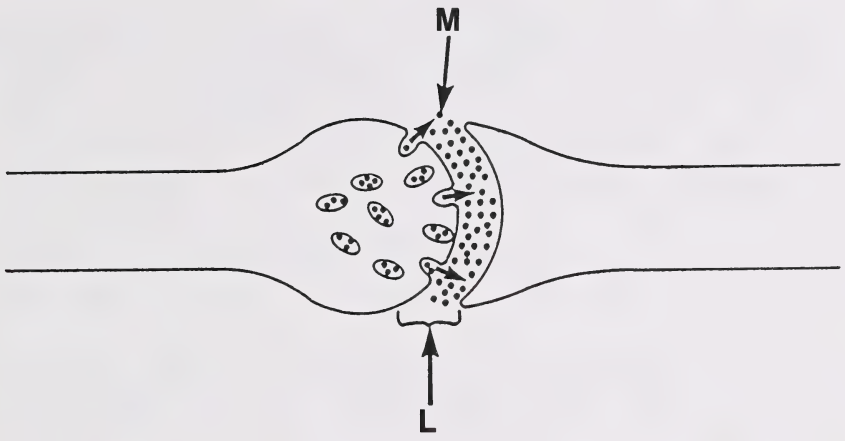
Use the following diagram to answer question 2.

Nerve Impulse Conduction



2. The diagram illustrates how a nerve impulse is conducted from one neuron to another. **(4 marks)**

a. Name the parts of the diagram labelled L and M.

Part L _____

Part M _____

b. How would nerve impulse conduction be affected if a chemical that is similar in shape to M were introduced into the neural pathway? Explain why this effect would occur.

_____

_____

_____

_____

_____

_____

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_____

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Use the following information to answer question 3.

An excerpt from "Bugged By An Ulcer? You Could Have a Bug."

"When Barry Marshall, a gastroenterologist then at Royal Perth Hospital in Australia, and his colleague Robin Warren reported in 1983 that they had found a bacterium in the stomach lining of patients with chronic gastritis [ulcers], the medical community was skeptical . . . Marshall has found the bacterium, *Campylobacter pyloridis,* in 90 per cent of patients with duodenal ulcers and 70 per cent of those with gastric ulcers. Although many gastroenterologists contend that the presence of the bacterium is merely coincidental, Marshall thinks it could be the cause of ulcers . . . Marshall is also testing treatments based on his theory . . . to help prove his theory, he ate the microbe and got gastritis. He recovered without taking drugs, but has vowed not to replicate the experiment." (From *Discover*, May 1987 © 1987 Discover Publications.)

(6 marks)

3. Based on your knowledge of the structure and function of the stomach and the causes of ulcers, discuss why the medical community might be skeptical of Marshall's theory. In your response, criticize Marshall's experimental design.

(**Four** marks will be allotted for concepts and **two** marks for evidence of logical thought expressed with appropriate vocabulary.)

(continued)

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4. Compare the relative levels of glucose in a renal (kidney) vein, a pulmonary artery, and the hepatic vein* to the level of glucose in the aorta. Write the words "**higher**", "**lower**", or "**similar**", as appropriate, in column I of the chart. Make the same kind of comparison in column II for the urea level and in column III for the CO_2 level. **(3 marks)**

Suggestion: It may be helpful to sketch a diagram of the circulatory system on a tear-out page before answering the question.

Blood Vessel	Column I	Column II	Column III
	Glucose Level	Urea Level	CO_2 Level
Aorta	basis for comparison	basis for comparison	basis for comparison
Renal (kidney) vein			
Pulmonary artery			
Hepatic vein*			

*Vein from liver to inferior vena cava

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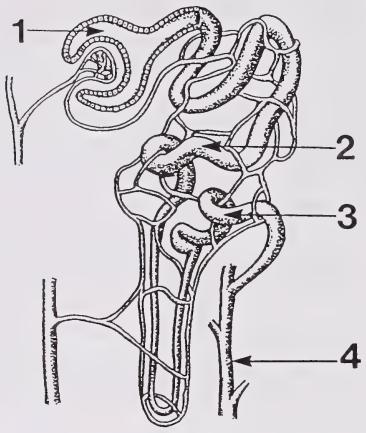
(6 marks)

5. The data in the table show changes that occur in the concentrations of glucose and urea as fluid moves through a nephron from locations 1 to 4.

Concentration of Glucose and Urea at Different Locations in the Nephron (mg/100 mL)

Solute	Location			
	1	2	3	4
Glucose	100	10	0	0
Urea	26	39	195	460

A Diagram of a Human Nephron



a. From the data in the table, construct a bar graph on the grid below. Use the vertical axis for the solute concentration.

(continued)

b. Provide an explanation for the changes in the concentration of each of the solutes.

Glucose _____

_____

_____

_____

Urea _____

_____

_____

_____

c. Select **either** glucose **or** urea and describe how the changes in concentration shown in the table help to maintain blood homeostasis.

_____

_____

_____

_____

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(4 marks)

6. Since amphetamines stimulate the sympathetic nervous system, their use by athletes has been banned. Chemical stimulation gives athletes using the amphetamines an unfair advantage in competitive sports.

a. Name a gland and the hormone produced by that gland that could cause physiological responses similar to those caused by amphetamines.

Gland _____ Hormone _____

b. Identify two physiological body responses to amphetamines that could give an athlete an advantage in a running event.

(i) _____

_____

_____

(ii) _____

_____

_____

c. Describe a physiological response that could return the body to a normal ''homeostatic condition'' following the ingesting of amphetamines.

_____

_____

_____

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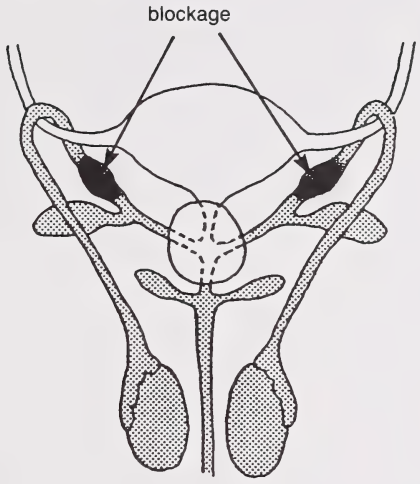
Use the following diagram to answer question 7.

An Adult Human Male Urogenital System Showing Blockage



7. Suppose an infection blocked the male urogenital system, as indicated in the diagram. What effect, if any, would the blockage have on the following systems? Support each answer with an explanation. **(3 marks)**

a. The excretory system _____

_____

_____

b. The reproductive system _____

_____

_____

c. The endocrine system _____

_____

_____

YOU HAVE NOW COMPLETED THE EXAMINATION. IF YOU HAVE TIME, YOU MAY WISH TO GO BACK AND CHECK YOUR ANSWERS.

TEAR-OUT PAGE

(NO MARKS WILL BE GIVEN FOR WORK DONE ON THIS PAGE)

FOLD AND TEAR ALONG PERFORATION

TEAR-OUT PAGE

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M1 M2 M3 M4

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